REMARKS

Reconsideration is respectfully requested.

Double patenting indication is incorrect

With respect to the advice that should claim 77 be found allowable, claim 89 would be objected to under 37 CFR § 1.75 as being a substantial duplicate thereof, it is respectfully submitted that a number of significant differences are present between these two claims as newly defined. The body of claim 89 fully and intrinsically sets forth all of the limitations of the claimed invention, and the preamble merely states the purpose or intended use of the invention, namely "for a distributed feedback laser cavity". The Examiner is referred in this regard to *Pitney Bowes, Inc v Hewlett-Packard Co.*, 182 F.3d 1298, 1305, 51 USPQ2d 1161, 1165 (Fed. Cir. 1999). See also *Rowe v Dror*, 112 F.3d 473, 478, 42 USPQ2d 1550, 1553 (Fed. Cir. 1997).

In addition, claim 89 includes the limitation of an interconnecting element which is absent from claim 77. Accordingly, whilst the two claims share a number of similar elements, the DFB element which is present in claim 77 is not recited in the body of claim 89, and an element (the interconnecting element) present in claim 89 is similarly not recited in claim 77. Therefore it is respectfully submitted that the respective scopes of claims 77 and 89 are clearly not substantially identical so as to be subject to a double patenting rejection. Reconsideration and withdrawal of the indication and anticipated objection of claim 89, as amended, under 37 CFR § 1.75 is respectfully requested.

The amendments overcome the claim rejections under 35 USC 102(b)

Claim 69 has been amended to incorporate the limitations of claim 71, now cancelled, claim 77 has been amended to incorporate the limitation of claim 82, now cancelled, and claim 89 has been amended to incorporate a limitation which is substantially identical to the limitations now recited claims 77 and 82 as added by this amendment. Claims 71 and 82 have been

cancelled. It is accordingly submitted that no new matter has been added to the claims which would necessitate the conducting of a new search, or consideration, since Claims 71, 77 and 89 have been considered as Claims 71 and 82 in the prior response.

The present invention as now claimed is directed towards a method and apparatus for reducing power fluctuations in the optical output of a laser cavity. In particular, as is pointed out in the specification section, Background to the Invention, the invention is directed towards the problem of reducing self-pulsations in DFB lasers which give rise to power fluctuations at the output of the laser cavity. The distributed feedback laser cavity is used to generate a laser signal, and a signal portion is redirected back towards the laser cavity. A saturable absorption grating is induced in a saturable absorption element external to the laser cavity in the optical path of the laser signal as a result of wave mixing of the laser signal and the redirected signal portion. The phase-discriminating properties of the induced saturable absorption grating in the optical path of the laser signal provide a phase-conjugated feedback signal to the laser cavity for reducing the power fluctuations in the optical output thereof. The present invention thus identifies and aims to solve in a cost effective and elegant manner the problem of self-pulsations within a laser cavity. The effect of this problem and various previous attempts made to solve it are set out in the specification Background to the Invention, at pages 1 and 2.

In contrast, Scifres et al. (US Pat. No. 5,103,456) is directed towards an integrated or monolithic master oscillator power amplifier (MOPA) structure. Essentially the problem that Scifres et al. try to solve is related to the performance of the amplifier, and in particular the reduction of feedback from the amplifier output facet to allow the amplifier to be operated at high gain without quenching the amplifier gain, with the resultant parasitic oscillation deteriorating the spectral coherence of the amplifier (see column 1, line 64 to column 2, line 28).

Scifres et al. is not at all concerned with the performance of the master oscillator and the quality of the signal it generates. According to Scifres et al., the master oscillator in fact generates a perfectly acceptable coherent output signal, and Scrifes et al is directed towards ensuring that the coherent output signal is not deteriorated or degraded by the subsequent amplifier stage. This is achieved by ensuring unidirectional coupling by effectively isolating the amplifier from the oscillator output in the reverse direction by means of an angled grating arrangement 17 configured to provide a barrier for preventing any feedback signals from traveling towards and adversely affecting the output of the oscillator (see, for example, column 2 at lines 25 to 28, column 5 at lines 42 to 45, and column 5 at lines 49 to 65).

Turning now to the statements made in the final paragraph on page 2 of the Office Action, the disclosure at column 2 lines 20 to 25 of preventing the deterioration of the coherence of the laser beam refers to the effect of the feedback from the output facet of the post-amplifier. The starting point of Scifres et al. is thus a coherent laser beam which does not suffer from noise or fluctuations, at the output of the master oscillator laser, contrary to what is suggested in the Office Action. It is submitted that the claims, as now amended, clearly specify how power fluctuations in the optical output of the laser cavity are reduced by providing the recited phase-conjugated feedback signal for the laser cavity.

In the final paragraph on page 3, the Office Action incorrectly suggests that the phase discriminating properties of the induced gratings are inherent in Fig. 8 of Scifres et al. owing to a similar structural arrangements between the induced grating of Fig. 8 and that of the present invention as claimed. This argument is extended to claims 71, 72, 82 and 83. The induced grating of Fig. 8 is achieved by virtue of the intensity modulation in the two plane waves in the double pass amplifier. The induced grating is configured, by virtue of the angled grating 17, to prevent the generation of a feedback signal which could influence the coherent output signal of

the master oscillator. The induced grating of Scifres et al. is a gain grating rather than an absorbtion grating of the type claimed in the claims of the present invention and accordingly has completely different properties. A gain grating discriminates against the standing wave field that created it, in that the amplification effect is minimized at the high points in the field.

In contradistinction, in an absorbtion grating, the high points in the standing wave field correspond to absorbtion minima. The auto-destructive nature of the gain grating with respect to the field that created it means that it does not have the phase discriminating properties of the claimed absorbtion grating, which provide a constructive phase-conjugated feedback signal of the type that is presently claimed in independent Claims 69, 77 and 89. Nowhere in Scifres et al. are the phase discriminating properties of the induced absorbtion grating either taught or suggested, and in particular nowhere is there taught or suggested the generation of a phase-conjugated feedback signal for the laser cavity. In fact, the provision of a phase-conjugated feedback signal for the laser cavity for reducing power fluctuations in the optical output of a laser cavity is clearly taught against in Scifres et al. In brief, Scifres et al. is drawn to preserving the coherence and integrity of an acceptable coherent output signal from a laser cavity by, *inter alia*, eliminating all feedback signals which could adversely affect the output signal, and by preventing subsequent deterioration of the coherent output signal by controlling amplifier gain using a gain grating. The present invention, in contrast, is directed towards providing a phase-conjugated feedback signal for the laser cavity using an absorbtion grating with the specific purpose of reducing power fluctuations in an imperfect output signal of the laser cavity. Figs. 2 and 4 of the present invention clearly show the positive effect of phase conjugated feedback, in particular, in eliminating sidelobes of the output signal from the laser cavity, which feature is now positively recited in each of the independent claims of this application.

Furthermore it is respectfully submitted that dependent claims 70, 72-76 and claims 78-81 and 83-88 meet the requirements of 35 USC § 102 as being dependent upon claims 69 and 77 respectively, argued above to be allowable. In addition, each of claims 70, 72-76 and claims 78-81 and 83-88 contain additional limitations which render these claims allowable over the references cited in the outstanding rejections .

Claim rejections under 35 USC § 103 have been overcome

Claim 77, 78 and 81 were rejected as being unpatentable over Scifres et al. in view of Feuer (US Pat. No. 6,078,597). With reference to the arguments submitted above in response to the claim rejections under 35 USC § 102, it is further respectfully submitted that neither Scifres et al. nor Feuer disclose use of the phase discriminating properties of the induced saturable absorption grating to provide a phase-conjugated feedback signal to the laser cavity for reducing the power fluctuations in the optical output of the laser cavity. Furthermore, neither suggestion nor incentive is provided in any of those cited references that would lead a person skilled in the art to arrive at the invention as claimed in claim 77. In view of the fact that Scifres et al. pointedly teaches away from the invention as claimed, it would not be obvious to a person having ordinary skill in the art to arrive at the claimed invention by forming the laser system of Scifres et al. into an erbium doped fibre as disclosed by Feuer. Thus, the proposed combination of references are respectfully considered to be improper as an example of hindsight reasoning.

For the above reasons, applicants respectfully request reconsideration and withdrawal of the outstanding rejections and earnestly solicit an indication of allowable subject matter.

Respectfully submitted,

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